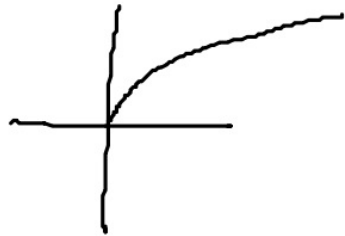


## 5.1 Exponential Functions

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function— Vertical line hits data only once



$$y = ab^{\textcircled{x}}$$

$$y = x^1$$

$$y = 1^x$$

$$y = ax \quad \text{coef}$$

$$y = ab^x$$

$b$  ratio

$> 1$  growth

$< 1$  decay

Ex. Automobile depreciate  
\$14,000  $\frac{1}{5}$  of value each year  
0.20

a) after 2 years

$$\begin{aligned} \$14,000 (0.2) &= 2800 \\ \$14,000 - 2800 &= 11,200 \end{aligned}$$

$$\begin{aligned} \$11,200 (0.2) &= 2240 \\ \$11,200 - 2240 &= 8960 \end{aligned}$$

$$14000 (0.8) = 11,200$$

$$11200 (0.8) = 8960$$

$$14000 (0.8)^2 = 8960$$

b) worth  $\frac{1}{2}$  of initial value

$$\frac{14000}{14k} (0.8)^x = \frac{7000}{4k}$$

$$(0.8)^x = 0.5$$

$$3 < x < 4$$

$$3.5 < x$$

exponential function  $y = ab^x$

decay



growth



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#1-4

$$54, 45 \quad \text{ratio} = \frac{45}{54} = \frac{5}{6} = .8\overline{3}$$

$$\text{decrease } 16.\overline{6}\% \quad y = ab^x$$

$$a) U_0 = 16$$

$$16, 12, 9$$

$$U_n = 0.75 U_{n-1}$$

$$y = 16 (0.75)^x$$

$$U_1 = 0.75 (U_0) = 12$$

$$y = U_0 b^x$$

$$U_2 = 0.75 \times 12 = 9$$

$$3b) f(x) = 3(2)^x$$

$$f(-3) = 3(2)^{-3} \\ = \frac{3}{2^3} = \frac{3}{8}$$

$$U_0 = 3$$

$$U_n = 2 \cdot U_{n-1}$$

$$\text{where } n \geq 1$$

$$U_n = \frac{1}{2} U_{n+1}$$

$$\textcircled{-4} -3 -2 -1 0 1 2 3$$

7.

4 a) 48, 36

$$\frac{36}{48} = \frac{3}{4} \quad 0.75$$

decrease 25%

$$|1 - 0.75| \times 100$$

$$0.25 \times 100 =$$

b) 54, 72

$$\frac{72}{54} = \frac{12}{9} = 1\frac{3}{9} = 1\frac{1}{3} \quad 1.\overline{33}$$

increase  $33.\overline{3}\%$   $|1 - 1.\overline{33}| \times 100 = 33.\overline{3}$

c)	Day	0	1	2	3	4
	Height (cm)	2.56	6.4	16	40	100

Measured at 8:00 Am  
each day.  
Immediate sprout  
upon planting.

a) Variables

exponential equation

$$y = 2.56(2.5)^x$$

Day 5

Day 6

b)  $y = 2.56(2.5)^x$      $x =$

c)  $\frac{24}{x} = \frac{2.5}{2}$

$$\frac{x}{24} = \frac{2}{2.5}$$

$$x = \frac{48}{2.5} = \frac{96}{5} = 19$$

base<sup>exponent</sup>

$$\boxed{3}^3 \quad \boxed{3}^{1/2}$$

$$3^3 = 3 \cdot 3 \cdot 3$$

expanded form

Inv.  $2^3 \cdot 2^4 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 2^7$

$$2^3 \cdot 2^4 = 2^{(3+4)} = 2^7$$

$$X^5 \cdot X^{12} = X^{17}$$

$$10^2 \cdot 10^5 = 10^7$$

$$a^m \cdot a^n = a^{m+n}$$



$$\frac{4^5}{4^2} = \frac{\cancel{4} \cdot \cancel{4} \cdot 4 \cdot 4 \cdot 4}{\cancel{4} \cdot \cancel{4}} = 4^3$$

$$\frac{x^8}{x^6} = x^2$$

$$\frac{a^m}{a^n} = a^{m-n}$$

$$\frac{x^3}{x^5} = x^{-2}$$

$$\frac{\cancel{x} \cancel{x} \cancel{x}}{\cancel{x} \cancel{x} \cancel{x} x x} = \frac{1}{x^2}$$

$$\frac{4^2}{4^3} = \frac{\cancel{4} \cdot \cancel{4}}{\cancel{4} \cdot \cancel{4} \cdot 4} = \frac{1}{4} = 4^{-1}$$

$$\frac{1}{8} = 8^{-1}$$

$$\frac{1}{15} = 15^{-1}$$

$$\frac{1}{2^3} = 2^{-3}$$